

# NASA TECH BRIEF



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## Low-Temperature Embrittlement of Ti-6Al-4V and Inconel-718 by High-Pressure Hydrogen

Tensile properties are reported of notched or unnotched specimens of titanium alloy Ti-6Al-4V (STA) at 70°, -109°, and -320°F under air at 1 atm or hydrogen or helium at 1000 and 2000 lb/in<sup>2</sup>. Under 200-lb/in<sup>2</sup> hydrogen the notch strength was reduced by about 45% at 70°F, 8% at -109°F, and nil at -320°F; unnotched specimens essentially were not embrittled at these temperatures.

Information is also available on tensile properties of notched or unnotched specimens of Inconel-718 at temperatures of 140°, 70°, -109°, and -320°F under air at 1 atm or hydrogen or helium at 1000 and 2000 lb/in<sup>2</sup>. Under hydrogen at 2000 lb/in<sup>2</sup> the notch strength was reduced by about 15% at 70° and 140°F and almost nil at -109° and -320°F; unnotched specimens were not embrittled. This degree of embrittlement is much lower than earlier observations under 1000-lb/in<sup>2</sup> hydrogen.

The 1000-cycle fatigue strength of precracked specimens of Inconel-718 was 22% less under hydrogen at 2000 lb/in<sup>2</sup> than under the same concentration of helium.

### Note:

Requests for further information may be directed to:  
Technology Utilization Officer  
Code A&TS-TU  
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No patent action is contemplated by NASA.

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